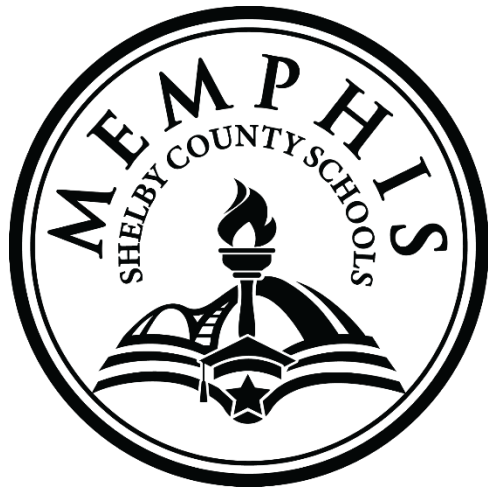


SUMMER SCHOOL TEACHER GUIDE



Biology I

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Summer School Teacher Guide

The Summer High School Program will be 20 days for full credit and 10 days for semester / half (½) credit). First Semester will be days 1-10 and Second Semester will be days 11-20. Breakdown of days will have the following per semester / half (½) credit:

- Nine (9) days of daily lessons
- One (1) day post-test review and post-test

All Students and staff will use Grade Results for their summer curriculum. Each lesson will open daily, and students will not be able to work ahead; however, students can work on previously opened lessons per semester. Students can retake a daily post-test 3 times before it locks. If a student needs to retake a daily lesson post-test for a 4th time, then the teacher will have to open the lesson post-test again. Teachers should not delete any prior lesson post-test. Grade Results will post the highest grade from each students' lesson post-test.

Classroom Schedule – Time below is an approximate breakdown of time.

- Attendance in PowerSchool – 5 minutes
- Lesson Introduction (I Do) – 5 minutes
- Lesson Activities/Supplemental (We Do) – 60 minutes
- **Break – 10 Minutes** (*Site Administrator will work with teachers on breaks*)
- Teacher Lesson Review – 5 minutes
- Independent Work – Student Lesson Review*/Post-test (They Do) – 40 minutes
- Closing/Wrap Up – 5 minutes
- **Total Time: 2 hours 10 minutes**

***Lesson Review** – Students will review lesson for essential knowledge/information prior to the daily test.

The following will be used within **Grade Results**:

- Lessons with Content Area, Videos, and Activities
- Supplemental Teacher Resources App – Some lessons will have a Supplemental resource (Example – Flocabulary)
- Post-Test – Each lesson will have a daily post-test.

Graded Work – The Posttest will be the daily graded work. Graded work is automatically calculated by the Grade Results Software.

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 1

Topic/Lesson Title & Grade Results #: Cells of Multicellular Organisms and Viruses (Biology Part 1: Lesson 1)

Objective(s): Students will

Part A

- Define cell.
- Describe plant and animal cells.
- Differentiate between plant and animal cells.
- Compare and contrast the given cells and classify them as either plant or animal cells.

Part B

- Discuss the structure of a virus.
- Discuss the living and non-living characteristics of viruses.
- Illustrate the dependence of viruses on other living things for their reproduction.

Guiding Question(s):

Part A

- What are cells?
- How are plant cells and animal cells different?
- What are some examples of plant and animal cells?

Part B

- What are the living characteristics of viruses?
- What are the nonliving characteristics of viruses?
- How are viruses unique from other life forms?
- How are viruses dependent on other living things for their survival?
- What are the differences between a plant virus, an animal virus, and a bacterial virus?

TN Curriculum Standard(s): **BIO1.LS1.1, BIO1.LS1.2**

- Compare and contrast existing models, identify patterns, and use structural and functional evidence to analyze the characteristics of life. Engage in argument about the designation of viruses as non-living based on these characteristics.
- Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

Part A

- **Carbohydrates:** Group of organic compounds made up of carbon, hydrogen, and oxygen, such as sugars.
- **Cell wall:** The rigid outermost cell layer found in plants and certain algae, bacteria, and fungi but characteristically absent from animal cells.
- **Cell:** A membrane-bound structure containing cytoplasm, nucleus and cell organelles.
- **Cellulose:** A polymeric carbohydrate component, which is the main constituent of plant cell wall, made up of glucose units.
- **Enzymes:** Chemicals that increase the rate of chemical reactions within the cells.
- **Multicellular:** Many celled.
- **Organelle:** A differentiated, specialized structure within a living cell having a specific function.
- **Tissue:** A group of cells destined to carry out a particular function.

Attendance in PowerSchool: (5 minutes)**Lesson Introduction (I Do): (5 minutes)**

Part A (Page 1-3)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

**Teacher note: Pages listed for lesson activities and supplemental are primary content focus pages in Grade Results. Teacher discretion can be used for all other pages not included here. Applicable throughout Semester 1 of this curriculum guide.*

Lesson Activities (We Do): (25 minutes)

Part A

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 4 - Video: Animal Cells (4:56); Video: Plant Cells (3:21)
- Page 5 – Plant and Animal Cell Examples
- Page 6 - NGSS Activity and Quick Check: Compare and Contrast Plant and Animal Cell

Supplemental:

- Page 1 - Flocabulary: Cells (2:48)
- Page 3 - Video: Cells and Their Organelles (8:13)
- Page 5 - Video: Cell to Organism (4:28)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

Part A

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Key Vocabulary/Terms:

Part B

- **Acellular:** Living things without conventional cell structures and functions.
- **Adsorption:** A process that involves the adhesion of a liquid or, most commonly, a gas, accumulating on the surface of a solid, to the solid.
- **Bacteriophage:** Virus that infects bacteria.
- **Capsid:** The head region of a virus that is made of proteins and glycoproteins, which contains the viral genetic material.
- **Cauliflower Mosaic Virus (CMV):** A plant virus of the genus *Caulimovirus* that infects plants and damages them.
- **Cell:** A membrane-bound structure containing cytoplasm, nucleus and cell organelles.
- **Cell wall:** The rigid outermost cellular layer found in plants and certain algae, bacteria, and fungi, but is characteristically absent from animal cells.
- **Cytoplasm:** Gel-like material, enclosed within the cell membrane, in which all cell organelles are embedded.
- **DNA:** Deoxyribonucleic acid, a double-stranded, self-replicating biopolymer nucleic acid, carrying the genetic information of an organism.

- **Enveloped virus:** A virus having a protein envelope around it, apart from the nucleocapsid.
- **Feline immunodeficiency virus (FIV):** A virus that infects only cats.
- **Genetic material:** Material that determines the inherited characteristics of a functional organism.
- **Genome:** The haploid set of chromosomes in eukaryotes.
- **Glycoproteins:** Conjugated molecules made of carbohydrate and protein units.
- **HIV:** Human immune-deficiency virus, a virus that causes AIDS (acquired immuno-deficiency syndrome) in humans.
- **Host cell:** A cell that harbors another organism or biological entity whose metabolism is used by the harbored organism for growth and reproduction.
- **Influenza virus:** The virus that causes flu.
- **Non-enveloped virus:** A virus devoid of protein envelope around it, apart from the nucleocapsid.
- **Nucleic acid:** A biopolymer, a long-chained macromolecule composed of interconnected nucleotides, that carries genetic information.
- **Plasma membrane:** A semi-permeable membrane of lipids and proteins which forms the external boundary of the cytoplasm of a cell.
- **Polio virus:** The virus that causes poliomyelitis.
- **Protein:** A biological macromolecule made up of nitrogen, carbon, oxygen, and hydrogen, an amino acids polymer.
- **Receptor:** A structure on the surface of a cell that selectively receives and binds a specific substance and causes the body to react in a particular way once the binding is done.
- **Replication:** The process that involves duplication or production of an exact copy of genetic material, such as a DNA molecule.
- **Reproduction:** A biological process by which new offspring are produced from their parents.
- **RNA:** Ribonucleic acid, a single-stranded nucleic acid present in all living cells.
- **Saliva:** Biological fluid secreted by the salivary glands that lubricates chewed food, moistens the oral walls, prepares food for swallowing, and initiates the process of digestion.
- **Tobacco Mosaic Virus (TMV):** A plant virus that infects tobacco and other plants belonging to the family Solanaceae and damages them.
- **Viral genome:** The whole genetic material of a virus.
- **Viroid:** an infectious agent composed exclusively of a single molecule of circular, single-stranded RNA (ssRNA), with some coiled-over, double-stranded-like regions.
- **Viruses:** Acellular organisms using nucleic acids as genetic material that require host cells for their replication, using the host metabolic machinery and ribosomes to form a pool of components, which assemble into particles called virions.

Lesson Introduction (I Do): (5 minutes)

Part B (Page 1-2)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (25 minutes)

Part B

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 4 - Animation: Viral Multiplication

Supplemental:

- Page 1- Floccabulary: Viruses (2:57)
- Page 2 - Video: BrainPOP Coronavirus (4:39)
- Page 3 - Video: Coronavirus COVID-19 (7:08)
- Page 8 - Video: HIV/AIDS: What is AIDS (3:21)
- Page 9 - Video: Understanding Polio (2:03)
- Page 10 - Video: The Discovery of Viruses (0:46)

Lesson Review: (5 minutes)

Part B

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Independent Work –Student Lesson Review*/ Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: **2**

Topic/Lesson Title & Grade Results #: **Similarities and Differences Among Cell Types (Biology Part 1: Lesson 2)**

Objective(s): Students will

- Differentiate between prokaryotes and eukaryotes.
- Describe the different modes of cellular reproduction.
- Explain the difference between meiosis and mitosis.
- Classify organisms as prokaryotes and eukaryotes.
- Describe the division of labor as it applies to cells.

Guiding Question(s):

- How are prokaryotes and eukaryotes different?
- What are the two types of cell division found in eukaryotes that allow cells to reproduce themselves?
- How are mitosis and meiosis different?
- How is reproduction accomplished in prokaryotes?
- What are some cell type differences among eukaryotic cells?
- How do the cells of multicellular organisms work together to maintain homeostasis?

TN Curriculum Standard(s): **BIO1.LS1.2, BIO1.LS1.6, BIO1.LS3.1**

- Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures.
- Create a model for the major events of the eukaryotic cell cycle, including mitosis. Compare and contrast the rates of cell division in various eukaryotic cell types in multicellular organisms.
- Model chromosome progression through meiosis and fertilization in order to argue how the processes of sexual reproduction leads to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Archaea:** A domain consisting of single-celled prokaryotes that was previously grouped with bacteria, before the discovery of their significant cellular differences.
- **Bacteriophage:** A virus that infects bacteria.
- **Cellulose:** A polymeric structural component of a plant cell wall that consists of many chains of glucose units.
- **Cell wall:** A rigid layer that surrounds certain types of cells, such as plants, fungi, and some bacteria.
- **Centriole:** A component of a centrosome.
- **Centromere:** The area of a chromosome that links the two sister chromatids together.
- **Centrosome:** An organelle containing centrioles that function as a microtubule-organizing center, forming spindles during mitosis and meiosis.
- **Chitin:** A structural component of fungal cell walls, a poly-N-acetyl glucosamine.
- **Chlorophyll:** A green pigment found in many photosynthetic organisms.
- **Chloroplasts:** An organelle within plant and algal cells that captures energy from sunlight, the site of photosynthesis.
- **Chromatid:** A copy of a duplicated chromosome.
- **Chromatin:** The combination of DNA and histone proteins found within the nucleus of a cell.
- **Cilia:** Small hair-like structures used for locomotion of unicellular eukaryotes.

- **Conjugation:** The exchange of genetic information between two prokaryotic cells via a cell-to-cell contact mechanism.
- **Cytokinesis:** The process of separating cytoplasm, nuclei, and organelles into two daughter cells, often following mitosis.
- **Deoxyribonucleic acid (DNA):** The molecule that carries the genetic information of all living organisms.
- **Diploid:** A cell containing two homologous copies of each chromosome, usually a maternal copy and a paternal copy.
- **Eukaryote:** A cell containing membrane-bound nucleus and organelles.
- **Flagellum:** A whip-like structure used for locomotion of unicellular organisms.
- **Gamete:** A sex cell that, when fused with the opposite gender's sex cell, forms a zygote.
- **Genetic recombination:** The production of new combinations of alleles, or gene variations, during the crossing-over process of meiosis.
- **Genome:** An organism's entire genetic information.
- **Glyoxysome:** A modified peroxisome organelle found in plants that contains enzymes; its function is to breakdown fatty acids.
- **Haploid:** A cell containing a single set of chromosomes.
- **Histones:** Proteins in the nuclei of eukaryotes that help in packing the DNA within a chromosome.
- **Homologous chromosomes:** A set of chromosomes that contain genes for the same traits.
- **Meiosis:** A form of cell division used in eukaryotes, necessary to carry out sexual reproduction.
- **Mitochondria:** Organelles found in eukaryotes that generate the cell's chemical energy.
- **Mitosis:** A form of nuclear division in eukaryotes in which the duplicated chromosomes are separated and new nuclei are formed.
- **Nuclear membrane:** The double lipid bilayer membrane that surrounds the genetic material within eukaryotic cells.
- **Nucleoid:** The region in a prokaryotic cell that contains most or all the genetic material.
- **Nucleus:** The organelle within a eukaryotic cell that contains the cell's genetic material.
- **Peptidoglycan:** The structural component of a bacterial cell wall.
- **Peroxisome:** An organelle within eukaryotes that its enzymes break down fatty acids.
- **Pilus:** A hair-like structure found on many bacteria that has the functions of attachment, motility, and gene transfer during conjugation, depending on its structure and composition.
- **Plasmid:** A small non-chromosomal piece of DNA, usually within a bacterial cell.
- **Prokaryote:** An organism whose cells lack membrane-bound nucleus and organelles.
- **Protist:** A group of eukaryotes often classified under the kingdom Protista.
- **Ribonucleic acid (RNA):** A biological molecule with functions related to gene regulation and expression, coding, and decoding.
- **Ribosome:** The site of protein production within a cell.
- **Tetrad:** A set of homologous chromosomes
- **Transduction:** The process of a prokaryote receiving another prokaryote's DNA via a bacteriophage vector.
- **Transformation:** The uptake of DNA from the environment by a prokaryote.
- **Vesicles:** Sacs made of membranes within a cell.

Attendance in PowerSchool (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Click and Learn: Nucleus
- Page 4 – Fill in the Blank/Matching Activity: Structural Differences
- Page 5 – Quick Check Question
- Page 6 – Video: Mitosis and Cell Division (4:03)
- Page 7 – Video: Meiosis (2:55)
- Page 10 – Quick Check Questions
- Page 12 – Matching Activity: Lesson Vocab

Supplemental:

- Page 1 – Flocabulary: Adaptation (2:43)
- Page 3 – Video: Khan Academy Comparing Mitosis vs Meiosis (5:50)
- Page 5 – Video: Cell Reproduction (0:43)
- Page 6 – Video: Meiosis and Production of Sperm Cells (4:35)
- Page 8 – Video: Phases of Mitosis (20:41)
- Page 9 – Video: Specialized Cell (1:35)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: **3**

Topic/Lesson Title & Grade Results #: **Membrane Transport (Biology Part 1: Lesson 3)**

Objective(s): Students will

- Differentiate between diffusion and osmosis.
- Explain active and passive transports with examples.
- Describe facilitated diffusion with an example.

Guiding Question(s):

- What is the function of the cell membrane?
- How does the cell move materials through the plasma membrane?
- How does passive transport work?
- What are the types of passive transport?
- What happens when an animal cell is placed in a water solution with different solute concentrations?
- How does active transport work?
- How is primary active transport different from secondary active transport?

TN Curriculum Standard(s): **BIO1.LS1.7**

Utilize a model of a cell plasma membrane to compare the various types of cellular transport and test predictions about the movement of molecules into or out of a cell based on the homeostasis of energy and matter in cells.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Active transport:** The transport of protein or other biological molecules from one cell to another through the cell membranes, against the concentration gradient.
- **Antiport:** The transport of molecules in the opposite direction to concurrent transport.
- **ATP (Adenosine Triphosphate):** The major source of energy for living cells, produced during cellular respiration.
- **Cytosol:** The gelatinous liquid found inside cells, excluding the cell organelles.
- **Dialysis:** The separation of substances in solutions by means of their unequal diffusion through semi-permeable membranes.
- **Diffusion:** The movement of molecules from a higher concentration to a lower concentration.
- **Hydrolysis:** Breakdown of a chemical bond in a molecule by adding H₂O to form different products.
- **Osmosis:** The process of movement of solvent molecules across a membrane from a region of higher solvent concentration to a region of lower solvent concentration.
- **Passive transport:** The transport of substances across a cell membrane without using up energy molecules.
- **Solution:** The combination of a solute and a solvent.
- **Symport:** The transport of different molecules across cell membranes in the same direction.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.

- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Diffusion (0:19)
- Page 4 – Animation: Facilitated Diffusion
- Page 6 – Video: Osmosis (0:28)
- Page 7 – Video: Cell Membrane and Osmosis (2:14)
- Page 8 – Click and Learn: Active Transport
- Page 9 – Matching Activity: Membrane Transport

Supplemental:

- Page 1, 2 – Video: BrainPOP Active Transport/Passive Transport (6:07)
- Page 3 – Video: Osmosis (3:45)
- Page 4 – Video: Diffusion of Food Coloring (0:39)

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the video quiz questions from BrainPOP Active and Passive Transport. Students will be encouraged to think critically and use the lesson notes to support their answers. The Quiz will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: **4**

Topic/Lesson Title & Grade Results #: **Homeostasis (Biology Part 1: Lesson 4)**

Objective(s): Students will

- Investigate the homeostasis mechanisms.

Guiding Question(s):

- Why is it important for organisms to maintain homeostasis?
- What is an example of a negative feedback mechanism in humans?
- What is an example of a positive feedback mechanism in humans?

TN Curriculum Standard(s): **BIO1.LS1.7**

Utilize a model of a cell plasma membrane to compare the various types of cellular transport and test predictions about the movement of molecules into or out of a cell based on the homeostasis of energy and matter in cells.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Brain:** An organ that serves as the center of the central nervous system.
- **Endocrine gland:** A gland that secretes hormones directly into the bloodstream.
- **Environment:** The surroundings that affects a thing.
- **Glucagon:** A hormone that raises the blood glucose level.
- **Homeostasis:** The maintaining of internal equilibrium of an animal by adjusting the physiological processes.
- **Hormones:** The secretions of the endocrine glands.
- **Hypothalamus:** A section of the brain responsible for releasing hormone production and thermoregulation.
- **Inorganic:** A substance that does not come from plant or animal material; or, chemically, a substance that is not made with a carbon skeleton.
- **Insulin:** A hormone that lowers blood glucose level.
- **Organic:** A material that comes from a living system; or chemically, a substance made with a carbon skeleton; or, in the marketplace, products that come from plants and animals that were not treated with chemicals.
- **Oxytocin:** A hormone secreted by the posterior pituitary gland.
- **Population:** A group of interbreeding organisms living in a particular area.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Animation: Negative Feedback Mechanisms
- Page 3 – Video: What is Homeostasis (0:32)
- Page 3 – Video: How Does Homeostasis Work? (0:48)
- Page 3 – Quick Check
- Page 4 – Quick Check
- Page 5 – Matching Activity: Homeostasis

Supplemental:

- Page 1 – Video: Khan Academy Membrane Transport and Homeostasis (8:25)
- Page 3 – Video: What is Homeostasis (0:25)
- Page 4 – Video: How Does Homeostasis Work? (0:45)
- Page 5 – Video: Osmoregulation (0:50)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Independent Work – Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 5

Topic/Lesson Title & Grade Results #: Relationship between Photosynthesis & Cellular Respiration (Biology Part 1: Lesson 5)

Objective(s): Students will

- Discuss the energy capture and release processes.
- Identify the sites, and describe the structures involved in cellular respiration and photosynthesis.
- Recognize the processes involved in photosynthesis and cellular respiration.
- Identify the different stages involved in photosynthesis and cellular respiration.
- Analyze the relationship between photosynthesis and cellular respiration.

Guiding Question(s):

- Why is ATP useful to cells?
- Where do organisms get energy?
- What happens during the process of cellular respiration?
- What happens during the process of photosynthesis?
- What is the relationship between cellular respiration and photosynthesis?

TN Curriculum Standard(s): BIO1.LS1.8, BIO1.LS1.9

-Create a model of photosynthesis demonstrating the net flow of matter and energy into a cell. Use the model to explain energy transfer from light energy into stored chemical energy in the product.

-Create a model of aerobic respiration demonstrating the flow of matter and energy out of a cell. Use the model to explain energy transfer mechanisms. Compare aerobic respiration to alternative processes of glucose metabolism.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Acetyl-CoA:** Compound synthesized by cells during the oxidation of pyruvate that plays a major role in metabolism.
- **Algae:** Unicellular or multicellular organisms, mostly green with no roots, stems, and leaves.
- **Amino acids:** Building blocks of proteins.
- **ATP:** Adenosine triphosphate, a nucleotide, has a large amount of chemical energy stored in its high-energy phosphate bonds.
- **ATP synthase:** Enzyme involved in the synthesis of adenosine triphosphate from adenosine diphosphate by addition of a phosphate.
- **Carbohydrate:** The abundant source of energy in food made up of carbon, hydrogen, and oxygen.
- **Cellular respiration:** Metabolic process through which living organisms produce energy through oxidation of substances.
- **Cellulose:** Polysaccharide constituting the cell wall of plants.
- **Chemiosmosis:** A process that involves generation of a proton gradient across mitochondrial membranes and thylakoid lumen.
- **Chlorophyll:** Green pigments present in plants, able to capture sunlight energy and provide the green color to plants.
- **Chloroplast:** Organelle found in plant cells where photosynthesis occurs.
- **Cristae:** Numerous folds in the inner membrane of mitochondria.

- **Dark reaction:** Energy utilizing part of the photosynthetic process to produce sugar molecules.
- **Electron Transport Chain:** A mitochondrial process, coupling an electron donor (such as NADH) and an electron acceptor (such as oxygen) across a membrane, used to generate ATP.
- **Energy:** Ability to do work.
- **FAD:** Flavin adenine dinucleotide, a compound that acts as a hydrogen acceptor in dehydrogenation reactions.
- **FADH₂:** Reduced electron acceptor involved in cellular respiration.
- **Food chain:** Transfer of energy from one organism to another.
- **Fungi:** A large group of eukaryotic organisms that includes yeast, mushrooms, and molds.
- **Glucose:** A simple 6-carbon sugar that is the major source of energy for body cells.
- **Glycolysis:** Process that involves a series of biochemical reactions, assisted by enzymes that break down glucose into different molecules in a step-by-step reaction.
- **Granum:** Stacked structures found within the chloroplasts, the site for the light reaction of photosynthesis.
- **Krebs cycle:** A series of nine reactions, breaking down pyruvic acid into carbon dioxide and releasing energy.
- **Light reaction:** Energy-capturing part of photosynthesis, producing molecules to be used during the dark reaction.
- **Lipids:** Chemical group name for fats and fat-related compounds, such as cholesterol, steroids, fatty acids, lipoproteins, and phospholipids.
- **Matrix:** Inner membranes of the mitochondria.
- **Mitochondria:** Self-replicating cell organelles involved in energy production.
- **NAD⁺:** Nicotinamide adenine dinucleotide, an electron carrier molecule, involved in cellular respiration.
- **NADH:** Reduced nicotinamide adenine dinucleotide (NAD).
- **NADPH:** Reduced nicotinamide adenine dinucleotide phosphate (NADP).
- **Oxidation:** Process involving the combination of a substance with oxygen, or a reaction in which electrons are lost.
- **Photosynthesis:** Process that helps to convert solar energy into chemical energy and produce food.
- **Protein:** Biological polymers made up of amino acids.
- **Protists:** Mostly unicellular, heterotrophic or autotrophic aquatic eukaryotic microorganisms.
- **Reduction:** Process of the addition of hydrogen to a molecule.
- **Solar energy:** Energy derived from the Sun.
- **Starch:** Naturally abundant, white, tasteless, solid carbohydrate stored in plants as the chief form of energy.
- **Stomata:** Pores found underneath the leaves of plants.
- **Stroma:** Inner space of a chloroplast.
- **Thylakoid membrane:** Membranes that surround the thylakoids.
- **Thylakoids:** Membrane-bound structures found within chloroplasts that contain components for photosynthesis.
- **Tissue:** A group of cells performing a particular function.
- **Yeast:** Microscopic unicellular fungi belonging to the phylum Ascomycota.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: The Process of Photosynthesis (2:40)

- Page 4 – Activity: Translate Metabolic Reaction into Words
- Page 5 – Activity: Metabolic Reactions (Equations and Explanations)
- Page 6 – Video: Photosynthesis (3:37)
- Page 8 – Matching Activity: Releasing Energy
- Page 11 – Drag and Drop Activity: Cell Respiration- Net Gain of ATP
- Page 16 – Puzzle Activity: Photosynthesis and Cellular Respiration

Supplemental:

- Page 1 – Video: BrainPOP Photosynthesis (2:01)
- Page 1 – Video: BrainPOP Cellular Respiration (3:34)

Break (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: **6**

Topic/Lesson Title & Grade Results #: **Sexual and Asexual Reproduction (Biology Part 1: Lesson 6)**

Objective(s): Students will

- Describe the three methods of asexual reproduction in animals.
- List the advantages and disadvantages of sexual and asexual reproduction.

Guiding Question(s):

- How do asexual and sexual reproduction compare?
- What are the advantages and disadvantages of asexual and sexual reproduction?

TN Curriculum Standard(s): **BIO1.LS3.1**

Model chromosome progression through meiosis and fertilization in order to argue how the process of sexual reproduction leads to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Apomixis:** An asexual reproduction in which the egg cells of a plant develop into a new plant without fertilization.
- **Budding:** Development of new organism, plant or animal, from an outgrowth or bud.
- **Cell:** The structural and functional unit of an organism.
- **Gamete:** A mature haploid (n) germ cell.
- **Grafting:** A technique that joins tissues of one plant with another.
- **Mitosis:** A cell division happening in body cells resulting in two identical cells.
- **Meiosis:** A cell division happening in sexually reproducing organisms.
- **Ovum:** The female reproductive cell or gamete of an animal.
- **Parthenogenesis:** Development of organism from an ovum without fertilization.
- **Pistil:** The female reproductive organ of a flower.
- **Spermatozoa:** The mature motile male sex cells of an animal.
- **Stamen:** The male reproductive organ of a flower.
- **Reproduction:** A process that creates a new organism.
- **Regeneration:** The natural renewal of a structure of an animal.
- **Zygote:** A diploid cell (2n) that is formed when an egg and sperm fuse.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Plant Reproduction (4:04)
- Page 3 – Video: Sexual Reproduction (1:29)
- Page 3 – Matching Activity: Sexual Reproduction
- Page 4 – Video: Understanding Sexual Selection (4:46)
- Page 4 – Quick Check: Asexual Reproduction
- Page 5 – Quick Check: Asexual Reproduction in Animals
- Page 6 – Quick Check: Asexual Reproduction Advantages and Disadvantages
- Page 7 – Pairs Activity: Animals
- Page 9 – Matching: Sexual and Asexual Reproduction

Supplemental:

- Page 1 – Video: Khan Academy Sexual and Asexual Reproduction (8:41)
- Page 4 – Video: Mitosis, Meiosis, and Sexual Reproduction (18:23)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 7

Topic/Lesson Title & Grade Results #: **Genetic Variation: Meiosis and Sexual Reproduction (Biology Part 1: Lesson 7)**

Objective(s): Students will

- Describe the process of meiosis.
- Explain how sexual reproduction produces offspring.
- Explain how reduction division results in the formation of haploid gametes in meiosis.
- Explain the importance of crossing over and independent of assortment in meiosis.
- Describe mutations that lead to genetic variation in organisms.
- Discuss the advantages and disadvantages of sexual reproduction.

Guiding Question(s):

- Why do the offspring of humans resemble their parents?
- How is an embryo formed?
- What events occur during each stage of meiosis?
- Why is Meiosis I called reduction division?
- How is Meiosis II similar to mitotic division?
- How does the formation of haploid gametes ensure the cells of human beings have 46 chromosomes?
- What is the significance of meiosis and genetic variation?

TN Curriculum Standard(s): BIO1.LS3.1

Model chromosome progression through meiosis and fertilization in order to argue how the processes of sexual reproduction leads to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Allele:** Alternative form of a gene present in the homologous chromosome.
- **Cell division:** Process using which cell buds or divides.
- **Cell:** The structural and functional unit of an organism.
- **Centrosome:** Small region of cytoplasm found near the nucleus.
- **Chiasma:** The junction point at which chromosome crossing over takes place.
- **Chromosome:** Threadlike gene-carrying structure found in the nucleus.
- **Crossing over:** The process of exchange of chromosomes between homologous chromosomes.
- **Cytokinesis:** Dividing the cytoplasm of a parent cell between two daughter cells.
- **Diploid:** Cells containing two complete sets of chromosomes.
- **DNA replication:** Process involving the synthesis of a copy of the cell's genetic material.
- **DNA synthesis:** The biochemical process involving the synthesis of DNA, the genetic material.
- **DNA:** Self-replicating genetic material, an acronym of deoxyribonucleic acid.
- **Drosophila:** A small fruit fly that is used in genetic research.
- **Fertilization:** A process that involves the fusion of male and female gametes.
- **Gamete:** A mature haploid (n) germ cell.
- **Gene:** The basic physical and functional unit of heredity.

- **Haploid:** A cell containing one complete set of chromosomes.
- **Homologous chromosomes:** Chromosomes that are similar in size, shape, and genetic material.
- **Meiosis:** A type of cell division that produces daughter cells with half the number of chromosomes as that of the parent cell.
- **Natural selection:** Process by which organisms with favorable variations survive and reproduce at a higher rate.
- **Ovary:** Female reproductive organ that produces eggs and female sex hormones.
- **Ovum:** The female reproductive cell or gamete of an animal.
- **Sexual reproduction:** A form of reproduction where two morphologically distinct types of specialized reproductive cells called gametes fuse, involving a female's large ovum (or egg) and a male's smaller sperm.
- **Sperm:** A male gamete or sex cell.
- **Spermatozoa:** The mature motile male sex cells of an animal.
- **Testis:** Male reproductive organ that produces spermatozoa and male sex hormones.
- **Tetrad:** A four-part chromosomal structure formed during the meiotic division.
- **Zygote:** A diploid cell resulting from the fusion of an egg and a sperm.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Labeling Activity- Embryo Formation
- Page 7 – Video: Meiosis I (4:06)
- Page 9 – Video: Meiosis II (3:33)
- Page 10 – Simulation: Meiosis- Overall Steps
- Page 13 – Identify Activity: Meiosis
- Page 20 – Video: Multiple Alleles and Punnett Squares (6:59)
- Page 24 – Video: Genetic Mutation (1:14)
- Page 25 – Drag and Drop Activity: Mutation

Supplemental:

- Page 4 – Video: Amoeba Sisters Meiosis (7:43)

Break: (10 minutes) Per Site Administrator

Lesson Review: (5 minutes)

- Teacher refers students to the lesson “wrap up” on page 26 to review an overview of Sexual Reproduction.
- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they’ve learned from the day’s lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: **8**

Topic/Lesson Title & Grade Results #: **Genetic Information in Nucleic Acids (Biology Part 1: Lesson 8)**

Objective(s): Students will

- Define the term nucleotides.
- Analyze the process of translation.
- Describe the structure of DNA and RNA.
- List the characteristics of genetic code.

Guiding Question(s):

- What is the role of DNA in heredity?
- How are the structures of DNA and RNA alike?
- What is the role of DNA and RNA in making a protein?
- What characteristics of the genetic code make it universal?

TN Curriculum Standard(s): **BIO1.LS1.3**

Integrate evidence to develop a structural model of a DNA molecule. Using the model, develop and communicate an explanation for how DNA serves as a template for self-replication and encodes biological information.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Base pair:** A pair of complementary bases, one from each strand, bonded to each other by hydrogen bonds, in a double-stranded nucleic acid.
- **Codon:** Sequence of three nucleotides specifying an amino acid.
- **Double helix:** The structure of the double-stranded molecules of DNA.
- **mRNA:** Messenger RNA, formed by transcription from a DNA strand.
- **Nucleic acid:** A long-chained macromolecule composed of interconnected nucleotides.
- **Nucleoside:** A combination of ribose or deoxyribose sugar and a nitrogenous base.
- **Nucleotide:** The basic subunit of all nucleic acids comprised of a nitrogenous base, a ribose or deoxyribose sugar, and a phosphate group.
- **RNA:** Ribonucleic acid, a single-stranded nucleic acid present in all living cells.
- **Transcription:** Process of transcribing genetic information stored in a DNA strand into a complementary strand of RNA.
- **Translation:** Process of synthesizing of a polypeptide from a messenger RNA template.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Quick Check: Nucleic Acids
- Page 4 – Video: Nitrogenous Bases (4:17)
- Page 5 – Video: The Structure of DNA (2:39)
- Page 6 – Video: The Recipe for Life (1:00)
- Page 9 – Video: Central Dogma- DNA Replication (5:03)
- Page 11 – Video: How to Read a Codon Chart (7:49)
- Page 13 – Quick Check

Supplemental:

- Page 4 – Reading: Learn.genetics.utah How Do Cells Read Genes

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up / thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 9

Topic/Lesson Title & Grade Results #: Transcription and Translation (Biology Part 1: Lesson 9)

Objective(s): Students will

- Describe the transcription process in eukaryotes and prokaryotes.
- Describe the post-transcriptional modification processes of mRNA.
- Describe the roles of tRNA, ribosomes, and mRNA in gene expression and protein synthesis.
- Describe the major steps involved in translation or protein synthesis.

Guiding Question(s):

- What is the process for gene expression?
- How is transcription for prokaryotes and eukaryotes different?
- Why does mRNA processing occur in eukaryotes and not prokaryotes?
- How does reverse transcriptase work?
- What role does the ribosome play in assembling a protein?
- How does the genetic code work?

TN Curriculum Standard(s): **BIO1.LS1.4**

Demonstrate how DNA sequence information is decoded through transcriptional and translational processes within the cell in order to synthesize proteins. Examine the relationship of structure and function of various types of RNA and the importance of this relationship in these processes.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Aminoacyl t-RNA:** t-RNA charged with an amino acid at its CCA terminus.
- **CCA terminus:** The region in tRNA where the specific amino acid corresponding to each codon is bound by an ester linkage.
- **Codon:** A triplet of nucleotides.
- **mRNA splicing:** Removing of introns from a primary mRNA transcript and joining the exons to produce a mature mRNA transcription.
- **Peptide bond:** A bond formed between the carbonyl group ($-C=O$) of one amino acid and the amine group ($-NH_2$) of another.
- **Pi:** Inorganic phosphate.
- **Polyribosomes or polysomes:** Clusters of ribosomes appearing like beads on a string, connected together to form a chain.
- **Pribnow box:** Promoter sequence of TATTAT in bacteria.
- **Retrovirus:** Virus that has RNA as genetic material and has the capacity to form complimentary DNA from RNA template.
- **Rho protein:** A protein involved in the termination of transcription in prokaryotes.
- **Ribosomes:** The cellular organelles involved in protein synthesis.
- **RNA polymerase or RNAP:** Enzyme that catalyzes the synthesis of mRNA from a DNA template.
- **Sigma factor:** A protein subunit that attaches itself to the core enzyme of RNAP.
- **Start codon:** The codon that initiates protein synthesis, which is AUG.
- **Stop codons:** Any of three codons -UAA, UAG, or UGA - that signal termination of synthesis of a protein.

- **Svedberg unit, S:** A unit of measurement determining the rate of sedimentation or sedimentation coefficient of a cellular component in an ultracentrifuge.
- **TATA box:** Promoter sequence in eukaryotes.
- **Template strand:** The strand of DNA that is used to create the complimentary mRNA strand.
- **Transcription:** Synthesis of mRNA from a DNA template.
- **Translation or protein synthesis:** A process in which the codons in mRNA are translated into the specific amino acid sequence to make a specific protein.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Quick Check: Transcription
- Page 4 – Quick Check: Transcription
- Page 5 – Quick Check: Post-Transcription
- Page 6 – Quick Check: Reverse Transcriptase
- Page 7 – Drag and Drop Activity 1
- Page 10 – Drag and Drop Activity 2
- Page 11 – Quick Check: Major Steps Involved in Translation
- Page 12 – Puzzle Activity

Supplemental

- Page 1 – Interactive: Learn.genetics.utah Translate and Transcribe a Gene

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 10

Topic/Lesson Title & Grade Results #: Post-Test Review and Post-Test

Objective(s):

- Students will review lessons to prepare for the final Post-Test.
- Final Post-test will open. All students must complete the final Post-Test.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil, or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Lesson Introduction (I Do):

Identify the purpose of the course

Connect the course to missing or future coursework and Post-test

Lesson Activities/Supplemental (We Do) – 30-60 minutes

Lesson Activities and Review (We Do):

Check Grade Results and have students review activities/lesson that they have not completed or need assistance with.

Hold an open Q&A for students to ask questions regarding the activities/lessons they are reviewing.

Independent Work – Posttest (They Do):

Students will review and complete any incomplete/missed/failed coursework.

Closing/Wrap Up:

Submit assignments as directed.

SEMESTER 2

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 11

Topic/Lesson Title & Grade Results #: Functional Variety of Proteins (Biology Part 2: Lesson 1)

Objective(s): Students will

- Discuss the functional variety of proteins.
- Illustrate the factors affecting the structure and functions of proteins.

Guiding Question(s):

- What is the composition of a protein?
- What are the different levels of protein structure?
- What is the relationship between structure and function in proteins?
- What are some of the various functions of proteins?
- What environmental factors affect protein structure?

TN Curriculum Standard(s): BIO1.LS1.5

Research examples that demonstrate the functional variety of proteins and construct an argument based on evidence for the importance of the molecular structure to its function. Plan and carry out a controlled investigation to test predictions about factors, which should cause an effect on the structure and function of a protein.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Alcohol:** A depressant drug which slows down the messages traveling between the brain and the body.
- **Amino acids:** Building block of proteins made up of a carboxyl (- COOH) and an amino acid (NH₂).
- **Bacteria:** Single-celled microorganisms that can exist either as independent (free-living) organisms or as parasites (dependent on another organism for life).
- **Biotin:** A B-vitamin found in many foods.
- **Chaotrope:** A molecule in water solution that can disrupt the hydrogen bonding network between water molecules.
- **Denaturation:** A structural change in macromolecules caused by extreme conditions.
- **Detergents:** A surfactant or a mixture of surfactants with cleaning properties in dilute solutions.
- **Diarrhea:** A condition in which feces are discharged from the bowels frequently in a liquid form.
- **Glycine:** The amino acid that has a single hydrogen atom as its side chain.
- **Hemoglobin:** The protein in red blood cells that transports oxygen to the body's tissues.
- **Hepatitis:** An inflammatory condition of the liver, commonly caused by a viral infection.
- **Hormones:** Special chemical messengers in the body that are created in the endocrine glands.
- **Macromolecule:** A molecule containing a very large number of atoms, such as a protein, nucleic acid, or synthetic polymer.
- **Metabolism:** The chemical process that occurs within a living cell necessary to maintain life.
- **Nucleoprotein:** A complex consisting of a nucleic acid bonded to a protein.
- **Pathogen:** A bacterium, virus, or other microorganisms that can cause disease.
- **Peptide bond:** A bond formed between the carbonyl group (-C =O) of one amino acid and the amine group (-NH₂) of another.

- **Polypeptide chain:** A single linear chain of many amino acids (smaller amino acids).
- **Polypeptide:** A linear organic polymer consisting of a large number of amino acid residues bonded together in a chain, forming part of (or the whole of) a protein molecule.
- **Proline:** A proteinogenic amino acid that is used in the biosynthesis of proteins.
- **Protein:** A biological compound made up of nitrogen, carbon, oxygen, and hydrogen.
- **Proton:** A subatomic particle, symbol: p. or. p⁺, with a positive electric charge of +1e elementary charge and a mass slightly less than that of a neutron.
- **Tissue:** A group of cells destined to carry out a particular function.
- **Virus:** An infective agent that typically consists of a nucleic acid molecule in a protein coat that is too small to be seen by light microscopy and can multiply only within the living cells of a host.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

**Teacher note: Pages listed for lesson activities and supplemental are primary content focus pages in Grade Results. Teacher discretion can be used for all other pages not included here. Applicable throughout Semester 2 of this curriculum guide.*

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 4 – Video: Proteins (4:02)
- Page 5 – Labeling Activity: Protein
- Page 6 – Activity: Protein Structure of Protein
- Page 8 – Identify Activity: Structure of Proteins
- Page 16 – Activity: Functional Variety of Proteins
- Page 20 – Video: Protein Production (3:15)
- Page 24 – Drag and Drop Activity: Functional Proteins

Supplemental:

- Page 1 – Click and Learn: Learn.genetics.utah Types of Proteins

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 12

Topic/Lesson Title & Grade Results #: **Effects of Mutation (Biology Part 2: Lesson 2)**

Objective(s): Students will

- Define Mutation.
- Discuss the types of mutation.
- Discuss the effects of different types of mutations on amino acid sequence and protein structure.

Guiding Question(s):

- How are gene mutations and chromosomal mutations different?
- What are the two types of point mutation and how are they different?
- What are the four types of chromosomal mutations?
- What are the effects of missense, nonsense, and silent mutations?
- What are the effects of mutations on protein structure and function?

TN Curriculum Standard(s): **BIO1.LS3.2**

Explain how protein formation results in phenotypic variation and discuss how changes in DNA can lead to somatic or germ line mutations.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Allele:** An alternative form of a gene.
- **Amino acid:** An organic compound containing an amino group and a carboxylic acid group, a monomer of proteins.
- **Anticodon:** Sequence of three nucleotides complementary to codon.
- **Chromosome:** Threadlike gene-carrying structure found in the nucleus.
- **Codon:** Sequence of three nucleotides specifying an amino acid.
- **Enhancers:** Regulatory elements that specify where and when particular genes are expressed.
- **Genetic code:** A set of rules that instructs the information stored in DNA to be translated into a protein.
- **Hieroglyphs:** A character of the ancient Egyptian writing system. Logographic scripts that are pictographic in form in a way reminiscent of ancient Egyptians.
- **Homologous chromosomes:** Chromosomes that are similar in size, shape, and genetic material.
- **Hydrophilic:** Molecule or substance attracted to water.
- **Hydrophobic:** Nonpolar substances do not combine with water molecules.
- **Microfibrils:** A tubular structure composed of collagen, which may occur in solitary or in groups in the extracellular matrix.
- **Non-homologous chromosomes:** Chromosomes that contain alleles for different types of genes.
- **Polypeptide:** Addition of amino acids to the peptide to form long chains by condensation polymerization.
- **Protein:** Biological compound made up of nitrogen, carbon, oxygen, and hydrogen.
- **Recessive:** An allele that produces its characteristic phenotype only when its paired allele is identical.
- **RNA:** Ribonucleic acid, a single stranded nucleic acid present in all living cells.
- **Stone tablet:** A rigid flat sheet of stone that is intended to bear an inscription.
- **Teratogen:** Any agent that can disturb the development of an embryo or fetus.

- **Transcription:** The process of transcribing genetic information stored in a DNA strand into a complimentary strand of RNA.
- **Translation:** A process in which the codons in mRNA are translated into the specific amino acid sequence to make specific protein.
- **Wobble theory:** In translation, during protein biosynthesis, there is a lower degree of specificity for base pairing of the 5' base of the anticodon in the RNA, allowing that RNA to make alternative hydrogen-bond interactions.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 5 – Activity: The Flow of Genetic Information in the Cell
- Page 7 – Video: The Different Types of Mutations (5:49)
- Page 8 – Drag and Drop Activity: Types of Point Mutations
- Page 9 – Video: Frameshift Mutations (1:28)
- Page 10 – Video: Chromosomal Mutations (4:10)
- Page 12 – Activity: Chromosomal Mutations
- Page 19 – Activity: Cystic Fibrosis
- Page 20 – Video: Lactose Intolerance (1:49)
- Page 21 – Activity: Lactose Intolerance
- Page 23 – Activity: Marfan Syndrome
- Page 24 – Video: Familial Hypercholesterolemia (1:43)
- Page 25 – Drag and Drop Activity: Haploinsufficiency
- Page 27 – Drag and Drop Activity: Hereditary Pancreatitis
- Page 28 – Video: The Effects of Mutations (4:09)

Supplemental

- Page 1 – Video: Amoeba Sisters Mutations (7:13)

Break (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 13

Topic/Lesson Title & Grade Results #: **Pedigree Analysis (Biology Part 2: Lesson 3)**

Objective(s): Students will

- Describe chromosomes and genes.
- Explain the pattern of inheritance.
- Analyze a pedigree chart.

Guiding Question(s):

- What are pedigree diagrams used for?
- How are genes and chromosomes related?
- How are traits inherited?
- What is sex-linked inheritance?
- How can a pedigree chart be used to investigate inheritance?

TN Curriculum Standard(s): **BIO1.LS3.3**

Through pedigree analysis, identify patterns of trait inheritance to predict family member genotypes. Use mathematical thinking to predict the likelihood of various types of trait transmission.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Alleles:** Alternate forms of a gene.
- **Autosomes:** All the chromosomes except the sex chromosomes found in a cell.
- **Chromosome:** An organized structure of DNA and protein that carries genes from parents to offspring.
- **Dominant allele:** The allele that produces its effect in a heterozygous condition.
- **Genes:** Sections of a DNA molecule that code for a whole protein.
- **Heterozygous:** A condition where an individual carries two different types of alleles for a trait on the homologous chromosomes.
- **Homologous chromosomes:** Chromosomes that are similar in size, shape, and genetic material.
- **Homozygous:** A condition where an individual carries the same type of alleles for a trait on the homologous chromosomes.
- **Recessive allele:** An allele whose effect is suppressed by the dominant allele in the heterozygous condition.
- **Sex chromosomes:** The chromosomes that determine the gender of an individual.
- **Trait:** Any of the features shown by an individual.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Pedigrees (9:37)
- Page 4 – Video: Pedigree Symbols
- Page 5 – Video: Genes, DNA and Chromosomes (0:24)
- Page 7 – Video: Inheritance Patterns (8:41)
- Page 9 – Video: Sex-Linked Traits (2:15)
- Page 12 – Activity: Pedigree Chart

Supplemental:

- Page 1 – Video: Genes and DNA (6:18)
- Page 2 – Video: Introduction to Heredity (17:26)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up / thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 14

Topic/Lesson Title & Grade Results #: Bioethical Issues in Stem Cell Research (Biology Part 2: Lesson 4)

Objective(s): Students will

- Describe gene technology.
- Identify and explain the bioethical issues related to stem cell research.

Guiding Question(s):

- What is gene technology?
- How can stem cells be used in gene technology?
- What are the ethical implications of stem cell research?
- Why use adult stem cells as an alternative to embryonic stem cells?

TN Curriculum Standard(s): BIO1.ETS2.3

Analyze scientific and ethical arguments to support the pros and cons of application of a specific biotechnology technique such as stem cell usage, in vitro fertilization, or genetically modified organisms.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Blastocyst:** An embryo which has developed (in humans) for 5-6 days.
- **Clone:** Generating genetically identical cells.
- **Deontology:** The theory that determines whether an act is right or wrong, based on whether or not it follows a moral rule or principle.
- **Embryonic stem cells:** Stem cells derived from embryos that develop from fertilized eggs.
- **Enucleated egg:** An egg with its nucleus fully removed.
- **IVF:** In vitro fertilization.
- **Natural Law:** The theory that determines that actions based on human nature are moral.
- **Pancreatic cells:** Gland cells that secrete the hormones insulin and glucagon, which regulate glucose metabolism.
- **Pluripotent cell:** A cell capable of giving rise to many different types of cells.
- **Polypeptide chain:** A protein molecule obtained by the condensation of a large number of amino acids.
- **Reproductive cloning:** When SCNT process results in the birth of a new organism.
- **SCNT:** Somatic-cell nuclear transfer, a laboratory technique used for creating a clonal embryo using a nucleus and an enucleated egg.
- **Stem cells:** Body cells that divide and differentiate into other specialized cells.
- **Therapeutic cloning:** The procedure of using SCNT to obtain embryonic stem cells.
- **Trophoblast:** The outermost cell layer of the blastocyst.
- **Utilitarianism:** The theory implies that the purpose of an action determines whether or not the action was right or wrong.
- **Zygote:** A diploid cell resulting from the effusion of two haploid gametes.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.

- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Introduction to Gene Technology (1:02)
- Page 5 – Video: Cloning Advances and Reproduction Cloning (5:07)
- Page 5 – Video: Somatic Cell Nuclear Transfer (1:59)
- Page 6 – Video: Therapeutic Cloning and Embryonic Stem Cells (8:22)
- Page 7 – Video: Bioethics (6:59)
- Page 8 – Video: Embryonic Stem Cell Research (4:59)
- Page 10 – Video: Scientists of the John Hopkins Berman Institute of Bioethics (5:56)
- Page 11 – Video: Drag and Drop Activity: Stem Cells

Supplemental:

- Page 3 – Video: Ethical Issues (3:34)
- Page 5 – Video: Learn.genetics.utah Unlocking Stem Cell Potential (4:09)

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 15

Topic/Lesson Title & Grade Results #: **Evolutionary Evidence of Common Ancestry (Biology Part 2: Lesson 5)**

Objective(s): Students will

- Describe how fossils provide information about the past.
- Discuss biogeography.
- Describe homologies with evidence.

Guiding Question(s):

- What is the theory of evolution by natural selection?
- How do fossils and biogeography provide evidence of evolution?
- What do homologies suggest about evolutionary change?

TN Curriculum Standard(s): **BIO1.LS4.1, BIO1.LS4.2**

- Evaluate scientific data collected from analysis of molecular sequences, fossil records, biogeography, and embryology. Identify chronological patterns of change and communicate that biological evolution is supported by multiple lines of empirical evidence that identify similarities inherited from a common ancestor (homologies).
- Using a model that demonstrates the change in allele frequencies resulting in evolution of a population over many generations, identify causative agents of change.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Amber:** Fossilized tree resin, mostly from conifers.
- **Biogeography:** The study of the distribution of organisms across Earth.
- **Cleavage:** The repeated division of a fertilized ovum.
- **DNA (Deoxyribonucleic acid):** A double standard nucleic acid that carries the genetic information in the cell.
- **Encasement:** A natural process where a whole organism is preserved as a fossil.
- **Fossil record:** All of the fossilized organisms and the information gained from them.
- **Fossil:** The mineralized evidence of living things or organisms that lived long ago.
- **Gastrulation:** The process of development of gastrula from a blastula.
- **Homologous structure:** Anatomically similar structures found in different species with a common evolutionary origin.
- **Homology:** Similar characteristics resulting from a common ancestor.
- **Paleomastodon:** Ancestor of the modern-day elephant that had a short trunk and short tusks on both upper and lower jaws.
- **Paleontology:** The branch of science that deals with fossilized animals and plants.
- **Permineralization:** A fossilization process in which deposited minerals replace organic remains.
- **Predator:** An organism that eats other organisms.
- **RNA (Ribonucleic acid):** A single standard nucleic acid that carries the genetic information in the virus and plays an important role in protein synthesis in cells.
- **Species:** A fundamental taxonomical unit.
- **Zygote:** The initial cell formed by the fusion of two haploid gametes.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 4 – Video: Natural Selection (7:48)
- Page 4 – Video: Multicellular Organisms and Evolution (3:18)
- Page 6 – Video: Paleontology (0:51)
- Page 7 – Activity: Fossils
- Page 9 – Activity: Paleontological Findings
- Page 16 – Activity: Homologies- Developmental Evidence
- Page 17 – Video: The Trans-Border Grizzly Bear Project (9:38)

Supplemental

- Page 1 – Interactive: PHET Natural Selection

Break (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

Part A

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.
-

Independent Work –Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the PHET interactive. Students will be encouraged to think critically and use the lesson notes to support their answers. The interactive lab will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 16

Topic/Lesson Title & Grade Results #: **Biomass (Biology Part 2: Lesson 6)**

Objective(s): Students will

- Discuss the relationship between a food chain and energy flow.
- Explain the 10% rule to measure the flow of energy.
- Demonstrate that the flow of energy is unidirectional.
- Identify how and where energy is lost in a food chain.
- Discuss how and why ecological pyramids are used to model the trophic levels.

Guiding Question(s):

- How does energy flow through ecosystems?
- Why is energy flow unidirectional?
- How do the laws of thermodynamics help explain energy flow?
- How do energy pyramids help analyze energy transfer through trophic levels?

TN Curriculum Standard(s): BIO1.LS2.4

Analyze data demonstrating the decrease in biomass observed in each successive trophic level. Construct an explanation considering the laws of conservation of energy and matter and represent this phenomenon in a mathematical model to describe the transfer of energy and matter between trophic levels.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Autotrophs:** Organisms that produce their own food through photosynthesis.
- **Biomass:** The mass of living organisms in an ecosystem.
- **Decomposers:** Microorganisms that break down organic matter and absorb the resulting products.
- **Energy-flow diagram:** The graphic representation of a movement of energy from one trophic level to the next.
- **Energy pyramid:** A graphic representation of the amount of energy transferred at each trophic level (from producers to consumers).
- **Food chain:** The chain in which food and energy transfer from one organism to another in an ecosystem.
- **Heterotrophs:** Organisms that consume autotrophs or other heterotrophs for food and use their energy.
- **Omnivore:** An animal that eats the food of both plant and animal origin.
- **Trophic level:** Each level in an energy pyramid.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 4 – Quick Check
- Page 5 – Quick Check: Energy Transfer
- Page 6 – Quick Check: Net Primary Productivity
- Page 8 – Activity: Food Chain and Food Pyramid
- Page 9 – Video: Trophic Relationships (3:34)

Supplemental:

- Page 1 – Video: BrainPOP Energy Pyramid (5:04)
- Page 2 – Video: The Food Chain (5:12)
- Page 3 – Video: Biomass Energy (2:22)
- Page 4 – Video: Biomass (5:59)
- Page 5 – Video: Biomass Fuels (2:15)
- Page 6 – Video: Biofuels (5:24)

Break: (10 minutes) Per Site Administrator**Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 17

Topic/Lesson Title & Grade Results #: Consequences of Human Population Growth (Biology Part 2: Lesson 7)

Objective(s): Students will

- Demonstrate how human population growth has been affected over time.
- Describe the demographic transition.
- Explain the consequences of human population growth.

Guiding Question(s):

- How did advances in agriculture and industrial growth lead to human population growth?
- What factors affect fertility rate?
- What does a demographic transition model help to explain?
- How does human population growth affect the environment?

TN Curriculum Standard(s): BIO1.LS2.1

Analyze mathematical and/or computational representations of population data that support explanations of factors that affect population size and carrying capacities of populations within an ecosystem. Examine a representative ecosystem and, based on interdependent relationships present, predict population size effects due to a given disturbance.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Biodiversity:** The variety of life forms within an ecosystem.
- **Demographer:** A person who studies the human population including its size, growth, density, and distribution.
- **Demographic transition:** A model that explains the change from high birth and death rates to a condition of low birth and death rates.
- **Economy:** Resource, production, trade, and consumption of goods of a country or a region.
- **Fertility rate:** The average number of children a woman has given birth during her lifetime.
- **Green revolution:** The introduction of new technology, crop varieties, machinery, and farming practices in the field of agriculture to increase production.
- **Life expectancy:** The average number of years an individual is expected to live.
- **Policy:** A set of rules or principle of action adopted by an organization or individual.
- **Pollution:** The introduction of foreign materials into the natural environment which has harmful effects on the ecosystem.
- **Population:** The total number of people inhabiting a country, city, or any district or area.
-

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Earth’s Population (1:44)
- Page 4 – Quiz Me Activity: Earth’s Population
- Page 6 – Quiz Me Activity: Agriculture and Population Growth
- Page 10 – Video: Life Expectancy (1:20)
- Page 12 – Video: The Demographic Transitions Model (2:41)
- Page 13 – Activity: The Demographic Transition
- Page 15 – Video: Ecological Footprint and Population Growth (3:05)
- Page 17 – Video: Environmental Consequences (3:51)
- Page 19 – Sorting Activity
- Page 20 – Video: Population Geography (27:22)
- Page 20 – Quick Check Activity: Factors Affecting Population

Supplemental: None**Break: (10 minutes) Per Site Administrator****Teacher Lesson Review: (5 minutes)**

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they’ve learned from the day’s lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.
-

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today’s lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn’t understand anything}

Summer School Lesson Plan

Subject/Grade: **Biology I**

Day: 18

Topic/Lesson Title & Grade Results #: **Nutrient Cycles (Biology Part 2: Lesson 8)**

Objective(s): Students will

- Define nutrient cycle.
- Describe the water cycle.
- Describe the carbon cycle.
- List the nitrifying bacteria.

Guiding Question(s):

- What are the main types of nutrient cycles?
- How does matter flow between trophic levels and among ecosystems?
- How is the carbon cycle significant to the processes of photosynthesis and cellular respiration?
- How does human activity affect the cycling of elements through the ecosystem?

TN Curriculum Standard(s): **BIO1.LS2.2**

- Create a model tracking carbon atoms between inorganic and organic molecules in an ecosystem. Explain human impacts on climate based on this model.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

- **Abiotic:** Non-living factors of the environment.
- **Ammonification:** Process of converting organic nitrogen into ammonia by bacteria.
- **Biotic:** Living elements of the environment.
- **Biosphere:** Parts of Earth that support life.
- **Biogeochemical cycles:** Cyclic movement of chemical elements of the biosphere between organisms and the environment.
- **Condensation:** Process by which vapor changes to a liquid.
- **Decomposers:** Microorganisms that break down organic matter and absorb the resulting products.
- **Denitrification:** Process of reducing nitrates to gaseous nitrogen.
- **Evaporation:** Way by which a liquid turns into a vapor.
- **Food chain:** Transfer of food energy from one organism to another in an ecosystem.
- **Herbivores:** Animals that eat plants.
- **Hydrosphere:** Areas of Earth that consists of water above and below the surface.
- **Mineral:** A naturally occurring inorganic material.
- **Nutrients:** Elements and inorganic compounds that are found in the environment; they are necessary for the growth and survival of animals and plants.
- **Nitrification:** Process where ammonia is converted into nitrites and nitrates by bacteria.
- **Precipitation:** Process of condensed water molecules falling down to earth as rain, snow, sleet, hail, etc.
- **Photosynthesis:** Process in which plants convert solar energy into food energy.
- **Transpiration:** Evaporation of water from plants into the atmosphere.

Attendance in PowerSchool (5 minutes)

Lesson Introduction (I Do): (5 minutes)

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.

- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (60 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Quiz Me Activity: Water Cycle
- Page 4 – Video: The Hydrological Cycle (2:53)
- Page 5 – Quiz Me Activity: Carbon Cycle
- Page 6 – Video: The Carbon Cycle (2:38)
- Page 7 – Quick Check Activity: Nitrogen Cycle
- Page 8 – Video: The Nitrogen Cycle (5:04)
- Page 9 – Video: Earth Systems (28:40)
- Page 9 – Activity: Quick Check
- Page 10 – Matching Activity: Nutrient Cycle

Supplemental:

- Page 1 – Flocabulary: The Water Cycle
- Page 2 – Video Activity: Khan Academy Biogeochemical Cycles (7:54)
- Page 3 – Video: The Carbon and Oxygen Cycles (1:25)
- Page 4 – Video: The Phosphorus and Nitrogen Cycles (1:50)

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the day's lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 19

Topic/Lesson Title & Grade Results #: Biological Succession & Human Impacts on Ecosystem (Biology Part 2: Lesson 9)

Objective(s): Students will

Part A

- Define succession.
- Determine the cause of a succession.
- Describe the steps involved in biological succession.
- Determine the major differences between primary and secondary succession.
- Explain how pioneer species contribute to ecological succession.
- Describe a climatic community.

Part B

- Define an ecosystem.
- List the various human activities that affect ecosystems.
- Describe the causes of water contamination.
- Explain the human activities that account for global warming.
- Analyze the effects of deforestation.

Guiding Question(s):

Part A

- How do communities change over time?
- What are the stages of primary succession?
- What are the stages of secondary succession?
- How do communities recover after a disturbance?

Part B

- How do humans impact the survival and health of the earth's ecosystems?
- How can humans protect the ecosystems?

TN Curriculum Standard(s): BIO1.LS2.3, BIO1.LS2.5

-Analyze through research the cycling of matter in our biosphere and explain how biogeochemical cycles are critical for ecosystem function.

- Analyze examples of ecological succession, identifying and explaining the order of events responsible for the formation of a new ecosystem in response to extreme fluctuations in environmental conditions or catastrophic events.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Key Vocabulary/Terms:

Part A

- **Aggregation:** A group of organisms of the same or different species living closely together.
- **Allogenic succession:** A pattern of succession characterized by an environmental change inducing biological succession.
- **Annual plants:** Plants existing for a single growing season.
- **Autogenic succession:** A pattern of succession in which the environment and plant community change due to the action of the plants.
- **Catastrophic climax:** Development of vegetation after a natural disaster.
- **Climatic climax:** The final stage of biological succession, made possible by and dependent upon a specific climate in its area.
- **Climax community:** A final, stable community in the ecosystem.
- **Climax:** The final stage of succession consisting of a stable community.
- **Community:** Group of various organisms in a specific place.
- **Controlled succession:** A pattern of succession that is controlled by humans.
- **Ecesis:** The establishment of a plant or animal in an environment.
- **Edaphic climax:** Local substrate conditions that control the development of climax communities in a particular region.
- **Intermediate species:** Species that replace the pioneer species within an ecosystem.
- **Invasion:** Establishment of a species in a barren area.
- **Nudation:** An area that is made barren.
- **Perennial plants:** Plants that survive for many growing seasons.
- **Pioneer species:** Species that colonize in barren areas.
- **Primary succession:** Succession that begins in a barren area.
- **Progressive succession:** A pattern of succession characterized by a transition of small, simple plant communities being replaced by large, complex plants with increased biomass.
- **Retrogressive succession:** A pattern of succession in which a disturbance causes the area to revert to an earlier seral stage.
- **Secondary succession:** Series of community changes that occur to recover the environment from the previously damaged habitat.
- **Seral:** Sequence of communities in a locality.
- **Seral stage:** A transition of plant communities during an ecological succession.
- **Sere:** The individual growth stage of an ecosystem.
- **Subclimax:** The period that occurs before the climatic climax.
- **Succession:** The transition of the species and environment of an ecosystem over time.

Attendance in PowerSchool: (5 minutes)

Lesson Introduction (I Do): (5 minutes)

Part A

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to begin the lesson.

Lesson Activities (We Do): (25 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Quiz Me: Nudation
- Page 5 – Quiz Me: Succession Causes and Patterns

- Page 7 – Video: The Theory of Plant Succession (3:24)
- Page 8 – Activity: Vegetation Type vs Timeline
- Page 9 – Drag and Drop Activity: Succession

Supplemental:

- Page 1 – Video: Ecological Succession- Change is Good (9:24)

Break: (10 minutes) Per Site Administrator

Teacher Lesson Review: (5 minutes)

Part A

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up / thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Key Vocabulary/Terms:

Part B

- **Atmosphere:** The gaseous mass surrounding Earth.
- **Dams:** A barrier constructed to control the flow of water and keep it from flowing to the sea.
- **Deforestation:** The clearing of forests in a certain area.
- **Desertification:** The transformation of fertile lands to a desert.
- **Ecology:** The branch of biology that deals with the relationship between living things and their environments.
- **Ecosystem:** The interaction of many organisms with their environment, that makes them function as an ecological unit.
- **Global warming:** The increase in the average temperature of Earth's climatic system.
- **Overfishing:** The overexploitation of fish populations in seas and lakes, leading to their significant depletion.
- **Pesticide:** A chemical used to control or kill pests.
- **Pollution:** Introduction of contaminants into the natural environment.
- **Sewage:** Waste material carried away from homes, businesses, and other buildings.
- **Urbanization:** Increasing the number of people, their homes, and their ancillary systems in urban areas.

Lesson Introduction (I Do): (5 minutes)

Part B

- Teacher introduces lesson objectives (1st page of each lesson) and anticipates questions about the topic/lesson title.
- Teacher explains how the lesson objectives support the TN Biology standard(s) for the lesson.
- Teacher uses guiding questions to gauge what students already know about the lesson and to activate prior knowledge.
- Teacher refers students to lesson vocabulary words (last page of each lesson) and asks students to identify familiar and unfamiliar vocabulary from the list.
- Teacher uses the lesson introduction (2nd page of each lesson) to introduce the lesson.

Lesson Activities (We Do): (25 minutes)

As a whole group, review lesson content information, answer quick check questions, complete the practice activities, discuss videos and animations. Students take notes as needed in notebook.

- Page 3 – Video: Clearing Forests for Farmland (6:04)
- Page 4 – Video: Consequences of Dams (1:56)
- Page 6 – Video: The Greenhouse Effect and Global Warming (7:51)
- Page 7 – Video: Deforestation, Soil Erosion, and Sedimentation (4:33)

Supplemental:

- Page 1 – Flocabulary: Ecosystems
- Page 3 – Video: Biotic (1:39)
- Page 4 – Video: The Effects of Deforestation, Conservation and Recycling (1:29)

Teacher Lesson Review: (5 minutes)

Part B

- Teacher refers students to the lesson review (next to last page of lesson) and asks a volunteer to read.
- Teacher refers students back to the lesson objectives and surveys (thumbs up/thumbs down) the class to see if everyone can demonstrate the lesson objectives.
- Teacher elicits student volunteers to recap what they've learned from the lesson.
- Teacher answers any questions students may still have.

Independent Work – Student Lesson Review*/Posttest (They Do): (40 minutes)

- The teacher will instruct students to complete the post-test. Students will be encouraged to think critically and use the lesson notes to support their answers. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: (5 minutes)

Take a moment to reflect on the lesson and pick one of the following closure activities as time permits. Example exit slip ideas to choose from: (Teacher may distribute sticky notes for student responses OR students may post responses in Teams meeting chat)

- Pretend your friend was absent from class today and s/he asks you to explain the lesson. What would you tell him/her?
- 3-2-1 (3 things you learned, 2 things you already knew, and 1 question you still have about the lesson)
- Rate your understanding of today's lesson. {Green = Keep going, I understand everything. Yellow = Slow down, I need more help. Red = Stop, I didn't understand anything}

Summer School Lesson Plan

Subject/Grade: Biology I

Day: 20

Topic/Lesson Title & Grade Results #: Post-Test Review and Post-Test

Objective(s):

- Students will review lessons to prepare for the final Post-Test.
- Final Post-test will open. All students must complete the final Post-Test.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMS meeting (if applicable)

Lesson Introduction (I Do):

Identify the purpose of the course

Connect the course to missing or future coursework and Post-test

Lesson Activities/Supplemental (We Do) – 30-60 minutes

Lesson Activities and Review (We Do):

Check Grade Results and have students review activities/lesson that they have not completed or need assistance with.

Hold an open Q&A for students to ask questions regarding the activities/lessons they are reviewing.

Independent Work – Posttest (They Do):

Students will review and complete any incomplete/missed/failed coursework.

Closing/Wrap Up:

Submit assignments as directed.